REMARKS

This Amendment responds to the Office Action dated April 17, 2006 in which the Examiner rejected claims 1-9 under 35 U.S.C. §103.

Applicant respectfully requests the Examiner acknowledge the information disclosure statement filed May 5, 2006.

As indicated above, claim 2 has been incorporated into claim 1. The amendment is unrelated to a statutory requirement for patentability.

Claims 1 and 6-9 were rejected under 35 U.S.C. §103 as being unpatentable over *Kim et al.* (U.S. Patent No. 6,484,300) in view of D*ickenscheid et al.* (U.S. Patent No. 6,965,809). Claims 2-5 were rejected under 35 U.S.C. §103 as being unpatentable over *Kim et al.* in view of D*ickenscheid et al.* and further in view of *Coon et al.* (U.S. Patent No. 6,988,060).

Applicant respectfully traverses the Examiner's rejection of the claims under 35 U.S.C. §103. The claims have been reviewed in light of the Office Action, and for reasons which will be set forth below, Applicant respectfully requests the Examiner withdraws the rejection to the claims and allows the claims to issue.

Kim et al. appears to disclose systems, methods and computer program products for determining a density of a pattern in an integrated circuit and for simulating a chemical-mechanical polishing process using the density that was determined. (Column 1, lines 13-17). Embodiments can provide systems, methods and/or computer program products that can obtain an effective pattern density of a layer of an integrated circuit from layout data that defines the layout. A grid of pattern cells is defined for the layout data. A respective pattern density is determined for a respective the pattern cell in the grid. An effective pattern density is calculated for a

first pattern cell in the grid. The effective pattern density for the first pattern cell is a function of the pattern density of at least second pattern cell in the grid that is remote from (i.e. nonadjacent) the first pattern cell, and a distance of the at least a second pattern cell from the first pattern cell. Adjacent cells also may be included, and preferably are included, in the effective pattern density. (Abstract).

Thus, *Kim et al.* merely discloses simulating a chemical-mechanical polishing process. However, nothing in *Kim et al.* shows, teaches or suggests a Fourier calculating part, a reverse Fourier calculating part, a spatial filter part and a height distribution calculating part as claimed in claim 1.

Dickenscheid et al. appears to disclose method for characterizing and simulating a chemical mechanical polishing process, in which a substrate that is to be polished, in particular a semiconductor wafer, is pressed onto a polishing cloth and is rotated relative to the latter for a defined polishing time. A method for characterizing and simulating a CMP process, in which a substrate to be polished, in particular a semiconductor wafer, is pressed onto a polishing cloth and is rotated relative to the latter for a defined polishing time. The method includes defining a set of process parameters, in particular a compressive force and a relative rotational speed between a substrate and polishing cloth; preparing and characterizing a test substrate having test patterns with different structure densities using the defined process parameters; determining a set of model parameters for simulating the CMP process from results of the characterization of the test substrate; determining layout parameters of the substrate which is to be polished; defining a profile of demands for a CMP process result for the substrate to be polished; and simulating the CMP

process in order to determine the polishing time required to satisfy the profile of demands. (Abstract).

Thus, *Dickenscheid et al.* merely discloses simulating a chemical mechanical polishing. Nothing in *Dickenscheid et al.* shows, teaches or suggests a Fourier calculating part, a reverse Fourier calculating part, a spatial filter part and a height distribution calculating part as claimed in claim 1.

Coon et al. appears to disclose precision alignment marks used in semiconductor integrated circuit manufacturing, and in particular to the simulation of signals generated by such marks. (Column 1, lines 9-12). An alignment simulation method simulates the signal waveform for an alignment mark using various alignment methods as well as the signal strength for an alignment mark, which is useful in optimizing the thickness of one or more layers as well as the geometry of the mark. The simulation of signal strength is also useful in optimizing the thickness of a layer for artifact wafers. The alignment simulation method includes accurately modeling the alignment mark, including one or more layers of various thicknesses and materials. The accurate modeling of the alignment mark includes such things as smoothing regions of the alignment mark and generating lateral shifts of the layers. The model of the alignment mark is a series of small pixels, each including the thickness of the layers and the layers indices of refraction. Using scalar diffraction, a complex reflectivity is generated for each pixel and a fast fourier transform is performed on the series of pixels. The results of the fast fourier transform are used to simulate the diffraction intensities for the alignment mark alignment systems, such as LIA or LSA as well as the signal waveforms. The LSA signal waveform, however, requires additional modeling of the alignment mark. An FIA image is generated by

removing appropriate orders from the fast fourier transform result and performing an inverse fast fourier transform and repeating the process at different light wavelengths and illumination angles. The signal strength is the maximum value of the image minus the minimum. (Abstract).

Thus, *Coon et al.* merely discloses a fast Fourier transform and an inversed fast Fourier transform. (Column 2, lines 51-58). However, nothing in *Coon et al.* shows, teaches or suggests a spatial filter part which subjects a two-dimensional Fourier image to a spatial filter such that only a component having a predetermined spatial frequency passes through as claimed in claim 1. Furthermore, since *Coon et al.* does not show, teach or suggest a spatial filter part, nothing in *Coon et al.* shows, teaches or suggests a reverse Fourier calculating part that subjects a two-dimensional Fourier image <u>after being subjected to a spatial filter</u> to a reverse Fourier transform as claimed in claim 1. Rather, *Coon* only discloses fast Fourier transform and inverse fast Fourier transform.

Additionally, *Coon et al.* merely discloses images can be averaged together to generate a final image. (Column 2, lines 58-59). Nothing in *Coon et al.* shows, teaches or suggests a height distribution calculating part that obtains a second calculated data by executing an operation of multiplying a pattern density at individual parts of a two-dimensional reverse Fourier image by a thickness of a laminated film laminated on the two-dimensional reverse Fourier image as claimed in claim 1. Rather, *Coon et al.* only discloses images can be averaged together to generate a final image.

Finally, *Coon et al.* is merely directed to simulating signal waveforms and signal strengths for an alignment mark in various alignment methods. (Column 2,

lines 3-5). Nothing in *Coon et al.* shows, teaches or suggests a simulator for chemical mechanical polishing process for planarizing a semiconductor substrate as claimed in claim 1. Rather, *Coon et al.* is directed to simulating signal strength and waveforms for an alignment mark.

A combination of *Kim et al.*, *Dickenscheid et al.* and *Coon et al.* would merely suggest simulating a chemical-mechanical polishing process as taught by *Kim et al.*, using the simulation by pressing a wafer into a polishing cloth and rotating relative to the latter for a defined polishing time as taught by *Dickenscheid et al.* and to simulate signal waveforms and signal strengths for an alignment mark as taught by *Coon et al.* Thus nothing in the combination of the references shows, teaches or suggests using Fourier and reverse Fourier calculations for a chemical polishing method nor do the combination of the references show, teach or suggests a spatial filter part and height distribution calculating part as claimed in claim 1. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claim 1 under 35 U.S.C. §103.

Claims 3-9 depend from claim 1 and recite additional features. Applicant respectfully submits that claims 3-9 would not have been obvious within the meaning of 35 U.S.C. §103 over *Kim et al.*, *Dickenscheid et al.* and *Coon et al.* at least for the reasons as set forth above. Therefore, Applicant respectfully requests the Examiner withdraws the rejection to claims 3-9 under 35 U.S.C. §103.

The prior art of record, which is not relied upon, is acknowledged. The references taken singularly or in combination do not anticipate or make obvious the claimed invention.

Thus, it now appears that the application is in condition for reconsideration and allowance. Reconsideration and allowance at an early date are respectfully requested.
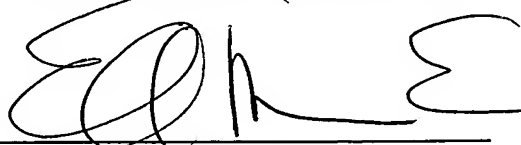
If for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is requested to contact, by telephone, the Applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed within the currently set shortened statutory period, Applicant respectfully petitions for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge our Deposit Account No. 02-4800.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: __July 11, 2006__   By: _____

Ellen Marcie Emas
Registration No. 32131

P.O. Box 1404
Alexandria, VA 22313-1404
703.836.6620

#1018862-v1